IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants	:	Joachim Löhr *et al.*
Application No.	:	10/583,671
Filed	:	November 7, 2008
For	:	QUALITY-OF-SERVICE (QOS)-AWARE SCHEDULING FOR UPLINK TRANSMISSION ON DEDICATED CHANNELS
Examiner	:	Habte Mered
Art Unit	:	2616
Attorney's Docket No.	:	007725.06114

DECLARATION OF JOACHIM LÖHR.
PURSUANT TO 37 C.F.R. §1.132

I, Joachim Löhr, declare as follows:

1. I currently hold the position of Senior Research Engineer at Panasonic R&D Center Germany GmbH, located in Langen, Germany, a company affiliated with the assignee of the above-identified application (the "Application"). I have been employed by Panasonic R&D Center Germany GmbH since June 2002.

2. As evident from the attached CV, I have been involved in the telecommunications research since I commenced my studies in communications engineering at the Technical University of Darmstadt, Germany, in 1997 and obtained my Diploma degree[1] in communications engineering in 2003. I joined Panasonic R&D Center Germany GmbH in 2002. Since April 2003, I am working as a research engineer in the field of wireless standard development. As part of my responsibilities, I have been involved in the development and standardization of wireless communication

[1] The German Diploma degree is comparable to a Master degree in the U.S.

networks in the 3rd Generation Partnership Project (3GPP) since then. In this connection, I have been actively participating in the development of the High Speed Uplink Packet Access (HSUPA) Work Item of the 3GPP RAN 2 working group (WG2), to which the Application pertains, authored and co-authored more than 70 contributions to the standardization within the 3GPP and attended numerous meetings of the 3GPP since January 2004. Presently, I am leading Panasonic Cooperation's activities in the 3GPP in the 3GPP RAN 2 working group for user plane standardization. I am also an inventor on a number of patents and patent applications (see enclosed list of patents and applications).

3. I am one of the inventors of the inventions disclosed and claimed in the above-captioned application (hereafter referred to as the Application. I co-invented the subject matter of the Application with Dragan Petrovic and Eiko Seidel. It is fair to say that I have a profound knowledge not only of the QoS-aware scheduling mechanism described in the Application, but of the knowledge available in this field as of the time of filing the Application.

4. I submit this Declaration as evidence of the differences of the presently claimed method for scheduling uplink transmissions over the references cited in this Office Action. I am familiar with the Application and have reviewed the outstanding final Office Action mailed on August 15, 2008, in addition to the documents cited by the Examiner in this Office Action. I provide my opinion on the invention as defined in the claims currently pending, taking into account the disclosure of the Application as originally filed, the general knowledge available in the art at the time the Application was filed, the level of skill of those of ordinary skill in the art and the subject matter from the below referenced prior art.

5. The present invention relates to scheduling uplink transmissions of mobile terminals in a mobile communication system considering their Quality of Service (QoS) requirements. The presently claimed method is useful in terms of

allowing the QoS-aware scheduling of individual mobile terminals that multiplex flows having different QoS attributes onto a single dedicated uplink channel (*see* Application as published, e.g. section [00076]).

The presently claimed method is based, in pertinent part, on the scheduler (for example, the base station) being informed by, for example, the Radio Network Controller (RNC) on the QoS attributes of the different flows of the mobile terminals which can be multiplexed to the dedicated uplink channel. A mobile terminal that desires to transmit data on the uplink sends a scheduling request to the scheduler to request an uplink resource. The scheduling request includes a flow identifier of one of the plural multiplexed flows the mobile terminal desires to transmit on the dedicated uplink channel. As the scheduler is aware of the QoS attributes for the different flows of the mobile terminals, the scheduler can associate the flow identifier in the scheduling request to the QoS attributes of the flow and bases its scheduling decision taking into account the QoS attributes of the flow. The scheduler may thus prioritize the allocation of uplink resources to the different mobile terminals that sent a scheduling request based on the QoS attributes associated to the flow identified in the respective scheduling requests (*see* Application as published, *e.g.*, sections [0121], [0141], [0142], [0144] and [0147]).

The presently claimed invention is therefore facilitating the scheduling of individual mobile terminals (i.e. <u>on a per-mobile terminal basis</u>) while still allowing for QoS differentiation of mobile terminals (UEs) <u>on a per-flows basis</u> (*see* Application as published, *e.g.* sections [0117], [0139], [0145]. The scheduling of the mobile terminals on a per-mobile terminal basis is expressed in the presently claimed invention by referring to the "scheduling request [...] requests the allocation of an uplink resource for transmission on the dedicated uplink channel to the mobile terminal transmitting the respective scheduling request". The provision of a per-flow QoS differentiation is reflected in the presently claimed invention in the feature of "scheduling [...] based on the QoS attributes related to the flow identified by the identifier" that is comprised in the scheduling request.

6. 3GPP contribution Tdoc. R2-041519, "QoS and Scheduling Principles in HSUPA" by Nokia) proposes different concepts for uplink scheduling of

the E-DCH for discussion in the 3GPP working group RAN 2 (*see* section 1), i.e. is related to the High Speed Uplink Packet Access (HSUPA) Work Item of the 3GPP RAN 2 working group. Tdoc. R2-041519 focuses its discussion on the prioritization of Node B scheduling and channel selective scheduling.

6.1 As a general comment, it should be noted that the 3GPP contribution Tdoc. R2-041519 (Nokia) has been discussed in the 3GPP RAN 2 working group in August 2004. At this point in time, the standardization and development of HSUPA and the related E-DCH transport channel was in a early stage. Tdoc. R2-041519 is therefore based on the assumption that the concepts used in High Speed Downlink Packet Access (HSDPA) are also applied to HSUPA. Accordingly, Tdoc. R2-041519 assumes that there is no multiplexing of MAC-d flows/priority queues provided – the multiplexing of multiple MAC-d flows into one TB (MAC-e PDU) on the transport channel, i.e. E-DCH, was agreed in December 2004, i.e., after the date of Tdoc. R2-041519, in meeting #45 of the 3GPP RAN 2 working group. It should be further noted that the contribution is a general discussion document, which is not proposing any specific detailed solution but rather discussing several scheduling principles on a rather abstract level of detail.

6.2 With respect to the prioritization of Node B scheduling, section 2.1 of Tdoc. R2-041519 relates to four different options how the Node B could differentiate the scheduling requests.

6.2.1 According to the "first option" discussed in section 2.1, the Node B does not differentiate between different requests by the UEs but simply gives some portion of the available (E-DCH) capacity to the request received first. This kind of solution does not take account relative priorities between different services in any way and thus all radio bearers mapped to E-DCH would have same priority in the Node B scheduler and consequently does not provide any QoS differentiation of the services.

Notably, unlike the present invention, there is no QoS differentiation in the scheduling decision of the Node B, i.e. the Node B does not consider any QoS attributes in the scheduling decision so that there is also no need to inform the Node B on the QoS attributes of the different flows.

Further, unlike the present invention, there is also no flow identifier provided in the scheduling requests (grant requests) of the UEs that could be used in scheduling the UEs by the Node B.

6.2.2 According to the "second option" discussed in section 2.1, the Node B knows the relative priority of each UE compared to the other UEs. In this case the Node B scheduler could take this relative priority into account when performing the scheduling decision based on different rate grant requests from different UEs. Relative priorities only indicate that one UE is higher priority than another UE and should be served therefore first. However, relative priorities provide no information on other QoS attributes (like delay tolerance, power offset, etc.) which are necessary to efficiently schedule uplink resources, i.e. such that an efficient BLock Error Rate (BLER), which is the common measure for efficient radio interface utilization, can be realized.

Notably, unlike the present invention, the Node B of Tdoc. R2-041519 is not aware of the QoS attributes of the individual flows (e.g. MAC-d flow, Radio Bearer) but knows only the relative priority of the individual UEs served by the Node B. Thus, unlike the presently claimed invention, in Tdoc. R2-041519, there is no differentiation on the per-flow level in the scheduling decision of the Node B.

Unlike the presently claimed invention, this "second option" discussed in Tdoc. R2-041519 is also not suitable when multiplexing different flows on a single dedicated uplink channel (*e.g.* E-DCH). As mentioned above, Tdoc. R2-041519 is assuming that no multiplexing of MAC-d flows is implemented.

In addition, unlike the presently claimed invention, the "second option" discussed in section 2.1 of Tdoc. R2-041519 is also no identification of a flow by means of a flow identifier within the scheduling request (grant request).

6.2.3 According to the "third option" discussed in section 2.1 of Tdoc. R2-041519, the Node B knows the relative priority between different MAC-d flows of different UEs. The Node B scheduler could take this relative priority of different MAC-d flows into account when performing the scheduling decision based on different rate grant requests from different UEs, if UEs are making grant request per MAC-d flows.

Although "this solution would work fine if only one priority level is transmitted inside one MAC-d flow," however "if multiple priorities ~~could be~~ [are] transmitted inside on MAC-d flow by MAC-d multiplexing, [as] this solution would

face similar problems as the second option and could complicate the signalling between the UE and the Node B." This subject matter may imply the multiplexing of logical channels to individual MAC-d flows. Nevertheless, Tdoc. R2-041519 assumes that the MAC-d flows themselves are not multiplexed, but scheduling is performed per MAC-d flow (considering the relative priorities of the MAC-d flows for which rate grant requests have been sent), which implies that there is data of one single MAC-d flow transmitted in a given transmission time interval via the transport channel. This is unlike the presently claimed invention requiring the multiplexing of plural flows to a transport channel.

Notably, unlike the present invention, in Tdoc. R2-041519 the Node B is not aware of the QoS attributes of the individual flows, but knows only the relative priority of the individual MAC-d flows served by the Node B. As outlined previously, relative priorities only indicate that one flow is higher priority than another flow and should be served therefore first. However, relative priorities provide no information on other QoS attributes (like delay tolerance, power offset, etc.) which are necessary to efficiently schedule uplink resources, i.e. such that an efficient BLock Error Rate (BLER), which is the common measure for efficient radio interface utilization, can be realized.

Further, unlike the present invention, in Tdoc. R2-041519, there is also no flow identifier provided in the scheduling requests of the UEs that allows the Node B to identify the QoS attributes related to the flow that are to be considered in the scheduling decision. As mentioned above, the Node B is using a relative prioritization of MAC-d flows in its scheduling decision. To enable the Node B to perform the scheduling based on relative priorities, Tdoc. R2-041519 proposes to include an indication of the priority of the respective MAC-d flow to the rate grant requests (confer the 1st and 2nd sentence in the paragraph following the paragraph starting "The fourth option ..." in section 2.1).

In Tdoc. R2-041519, the indication of the priority of the MAC-d flow within the grant request is thus not allowing the Node B to identify the MAC-d flow for which the grant request has been sent, so that the Node B cannot base its scheduling decision on its QoS attributes.

In addition, unlike the present invention, in Tdoc. R2-041519, there is no per-mobile terminal scheduling to request the allocation of an uplink resource for a transmission of multiplexed data of the plurality of flows, as the scheduling requests (grant request) are sent per-MAC-d flow (which could be referred to as "per-MAC-d flow scheduling").

6.2.4 According to the "fourth option" discussed in section 2.1 of Tdoc. R2-041519, each MAC-d flow would have priority queues for different priorities in MAC-e of the UE and the Node B knows the relative priority of each priority queue. The Node B scheduler takes this relative priority of different priority queues flows into account when performing the scheduling decision based on different rate grant requests from different UEs, if UEs are making grant request per priority queue.

It should be noted that there appears a copy-and-paste error in Tdoc. R2-041519 in the second sentence of the section describing the "fourth option" reciting that "The Node B scheduler could take this relative priority of different *MAC-d flows* into account [...]". This passage should read "The Node B scheduler could take this relative priority of different *priority queues* into account [...]" in view of the preceding sentence and the following sentences all referring a distinction of grant requests for individual priority queues.

The "fourth option" discussed in section 2.1 of Tdoc. R2-041519 does not set any restrictions on possible MAC-d multiplexing. However, this flexibility introduces extra complexity as priority queue distribution and multiple priority queues per MAC-d flow would be needed in UEs. The term "MAC-d multiplexing" should not be misinterpreted. The term does not refer to the multiplexing of MAC-d flows, but refers to the MAC-d entity providing a multiplexing function to multiplex different logical channels (that are input to the MAC-d entity) to a single MAC-d flow (that is output by the MAC-d entity). The "fourth option" discussed in section 2.1 of Tdoc. R2-041519 thus relates to a system in which there appear no restrictions on the multiplexing of logical channels (having different priorities) to a MAC-d flow in the MAC-d entity, but complexity is added due to requiring "de-multiplexing" data of a single MAC-d flow to distribute same to multiple priority queues according to their priority. Accordingly, on the network side, the reordering would be needed to be done separately for each priority, i.e. each priority would need separate reordering buffers, compared to

the "third option" where only one priority queue and reordering buffer is needed per MAC-d flow in UE and in S-RNC. If the re-ordering would be done on logical channel level, separate re-ordering distribution is not needed, as there would be one re-ordering queue per logical channel after MAC-e and MAC-d de-multiplexing.

Similar to the "third option" discussed in section 2.1, Tdoc. R2-041519 again fails to disclose plural flows multiplexed to a transport channel. In the "fourth option" discussed in section 2.1 of Tdoc. R2-041519, scheduling is performed per priority queue, which implies that there is data of one single priority queue transmitted in a given transmission time interval via the transport channel.

Notably, unlike the present invention, in Tdoc. R2-041519 the Node B is not aware of the QoS attributes of the individual flows, but knows only the relative priority of the individual priority queues served by the Node B. As previously mentioned, relative priorities only indicate that one flow is higher priority than another flow and should be served therefore first. However, relative priorities provide no information on other QoS attributes (like delay tolerance, power offset, etc.) which are necessary to efficiently schedule uplink resources, i.e. such that an efficient BLock Error Rate (BLER), which is the common measure for efficient radio interface utilization, can be realized.

Further, unlike the present invention, in Tdoc. R2-041519, there is also no flow identifier provided in the scheduling requests of the UEs that allows the Node B to identify the QoS attributes related to the flow that are to be considered in the scheduling decision. As mentioned above, the Node B is using a relative prioritization of priority queues in its scheduling decision. To enable the Node B to perform the scheduling based on relative priorities, Tdoc. R2-041519 proposes to include an indication of the priority of the respective priority queue to the rate grant requests (confer the 1st and 2nd sentence in the paragraph following the paragraph starting "The fourth option ..." in section 2.1).

The indication of the priority of the priority queue within the grant request is thus not allowing the Node B to identify the priority queue for which the grant request has been sent, so that the Node B cannot base its scheduling decision on its QoS attributes.

In the "fourth option" taught in Tdoc. R2-041519 the scheduling requests (grant requests) are sent per priority queue, unlike the present invention, where the scheduling requests are sent per mobile terminal to request the allocation of an uplink resource for a transmission of multiplexed data of the flows on the uplink transport channel.

7. Kekki *et al.* (US 2005/0073953 A1) relates to supporting DiffServ Code Points (DSCPs) commonly used in IP based network for IP-based services in a UMTS system (*see* sections [0012] and [0013]). In particular, Kekki *et al.* disclose DSCPs supported by the Radio Network Layer (RNL) of a mobile communication system (*see inter alia* sections [0018] and [0019]).

7.1 For understanding the subject matter of Kekki *et al.* it is important to understand the meaning of the terms Radio Network Layer (RNL) and Transport Network Layer (TNL), the latter frequently occurring in this document. The figure (Fig. 10) below is showing the general protocol model within the UTRAN at the time of filing of Kekki *et al.*

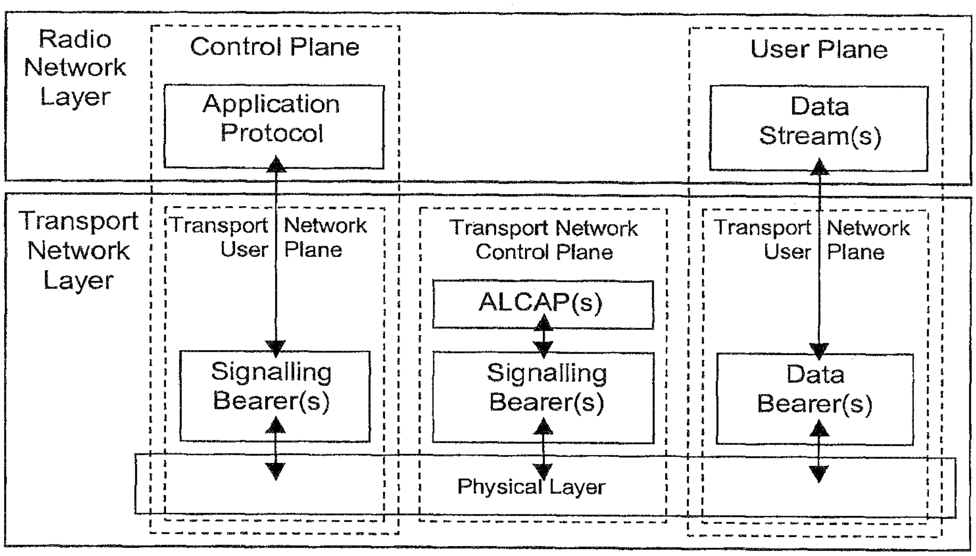

Figure 10: General Protocol Model for UTRAN Interfaces[2]

[2] The Figure is taken from 3GPP TS 25.401, "UTRAN overall description (Release 6)", version 6.2.0, December 2003

The Protocol Structure consists of two main layers, Radio Network Layer (RNL), and Transport Network Layer (TNL). All UTRAN related issues are visible only in the RNL, and the TNL represents standard transport technology that is selected to be used for UTRAN, but without any UTRAN specific requirements.

The Control Plane (CP) on the RNL includes the Application Protocol, i.e. RANAP, RNSAP or NBAP, and the Signalling Bearer in the TNL for transporting the Application Protocol messages. Among other things, the Application Protocol is used for setting up bearers for (i.e. Radio Access Bearer or Radio Link) in the RNL. In the User Plane of the UTRAN architecture, there are the Data Stream(s) of the individual services, i.e. the flows in the Application, which are transported by so-called Data Bearers in the TNL.

The next figure (Fig. 23) below, is illustrating the protocol model to highlight how data of the MAC-hs transport channel[3] is distributed via the Uu interface between UE and Node B and via the Iub interface between Node B and CRNC/SRNC for the case of HSDPA (providing the HS-DSCH transport channel). Please note that the following explanations are valid for other MAC layer configurations and transport channels as well.

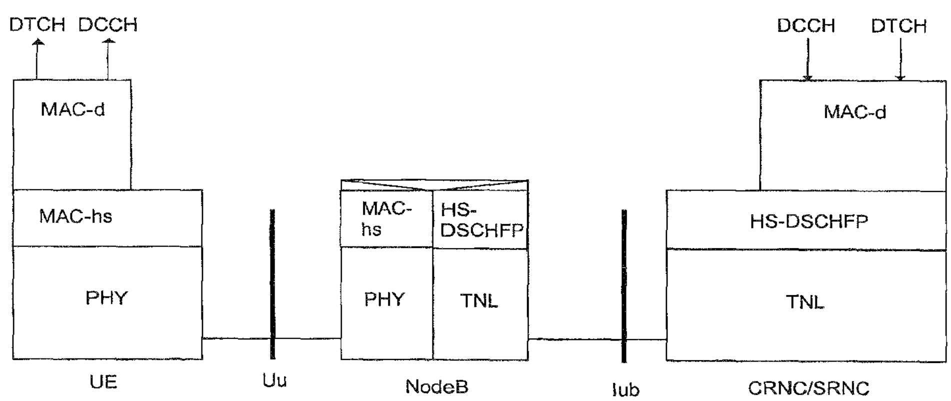

Fig. 23: HS-DSCH Co-incident Controlling and Serving RNC[4]

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[3] Fig. 23 of 3GPP TS 25.401 has been chosen, as Kekki *et al.* also refers to the example of HS-DSCH in section [0056].

[4] The Figure is taken from 3GPP TS 25.401, "UTRAN overall description (Release 6)", version 6.2.0, December 2003

As can be seen in the figure above, the Transport Network Layer (TNL) refers to the wired interface, Iub, between Node B and RNC (in some configurations to the wired interface, Iub, between Node B and RNC and the wired interface, Iur, between two RNCs) that is used to convey the data of the transport channels between UE and RNC.

7.2 As shown in Fig. 4, Kekki *et al.* disclose that the RNC signals either a DSCP or Transport Network Layer (TNL) QoS information to the Node Bs together with an indication (flag) indicating the type of information being sent (*see* sections [0039] to [0043]). Accordingly to Fig. 4, the TNL QoS information received in step 100 either contains the DSCP itself or a generic TNL-QoS that is converted into a DSCP. (*see* Fig. 4, step 112, sections [0046] and [0047]).

Accordingly, the gist of the Kekki *et al.* system resides in the introduction of signaling TNL QoS-related information from the RNC to the Node B that either comprises a DSCP or a generic TNL-QoS Code Point. Kekki *et al.* mentions that the DSCP or generic TNL-QoS information may be conveyed by an Information Element (IE) of the Node B Application Part (NBAP) protocol during a Radio Link Setup and Radio Link Configuration (*see* section [0048]). This essentially means that upon setup of a Radio Link on the RNL between UE and RNC, QoS -related information for the Data Bearers in the TNL are provided to the Node B. The TNL-QoS information contains information of the QoS attributes for transporting data of the dedicated (transport) channels or shared (transport) channels via the Data Bearers (see Fig. 10) on the interface between Node B and RNC (*see* section [0058]).

To summarize, Kekki *et al.* provide the Node B with information on the QoS that should be provided on Transport Network Layer (TNL), i.e. the wired interface, Iub, between Node B and RNC, when receiving/forwarding the UE data on the transport channels from/to the RNC. This bears no relation to the presently claimed invention of scheduling uplink transmissions on the radio interface between UE and Node B taking into account QoS attributes of one of a plurality of flows to be multiplexed to the transport channel.

The system of Kekki *et al.* thus fails to relate to any of the features of the presently claimed invention. Although Kekki *et al.* forwards TNL-QoS information from a RNC to a Node B, this is not the same thing as the feature of the presently

claimed invention of forwarding QoS attributes from a RNC to a Node B that relate to flows and are used in scheduling uplink resources to a UE to transmit data of flows multiplexed to an uplink transport channel. (Please note that the term "flow" in the presently claimed invention is not the same things as and cannot be interpreted as a "transport channel" to which the TNL-QoS information bear some relation in Kekki *et al.*, as the "flows" are multiplexed to a "uplink transport channel" in the presently claimed invention.)

8. Schultz *et al.* disclose a "scheduling algorithm" of a UE or RNC within a UMTS system that is aiming to improve the Generalized Processor Sharing (GPS) as presented in the article "A Generalized Processor Sharing Approach to Flow Control in Integrated Services Networks: The Single Node Case", by Parekh *et al.* published in the IEEE-ACM transactions on networking, volume 1, no. 3 June 1993 (*see* page 12, lines 19-30). The disclosed "scheduling" approach aims to satisfy the guaranteed bit rate of highest priority channels as long as possible still providing a minimum level of service to all flows (*see* page 33, lines 8-12 and page 28, lines 19 to page 29, line 9). In this context, the term "flow" refers to a logical channel. In Schultz *et al.* QoS is known on a logical channel-basis, i.e. each logical channel has a QoS class (see page 23, lines 7-9) and also touches on the multiplexing of logical channels (see page 21, lines 20-24, page 23, lines 13-17 and page 29, lines 4-6).

The term "scheduling" as used in Schultz *et al.* does not relate to the scheduling of uplink resources by a Node B in response to a scheduling request from a UE, as in the presently claimed invention. The term "scheduling" is used in Schultz *et al.* to describe the scheduling within a UE or RNC by means of an optimized algorithm for performing a GPS-based TFC selection (*see* e.g. page 17, lines 22-23; page 13, lines 6-18), that is an algorithm that is distributing the physical air interface resources ("predetermined transmission bandwidth") already granted to a UE to the individual services (logical channels) of the UE.

As outlined in detail by Schultz *et al.*, the RRC entity determines the transport block size (TBS), i.e. the number of bits the MAC entity can transmit to the physical layer in a single transmission time interval (TTI) (*see* page 10, lines 19-23), and configures the MAC entity with a so-called Transport Format Combination Set

(TFCS), which contains the allowed Transport Format Combinations (*see* page 11, lines 6-9) that can be used for transmission to thereby determine the radio resource that can be used by for transmission within a TTI. The different logical channels that are multiplexed to the transport channels need to share the allocated radio resource for a given TTI. The TFC selection algorithm effectively determines how the radio resource is to be shared among the logical channels (*see* page 12, line 3 to page 13, line 18), i.e. how many bits of each logical channel are transmitted in each TTI to fill the given TBS.

The gist of Schultz *et al.* resides in the optimized GPS-based TFC selection algorithm that schedules the data of the individual logical channels taking into account their QoS attributes (*see* page 21, lines 12-31). The GPS-based TFC selection algorithm of Schultz *et al.* can be either used within the UE for uplink transmissions or by the RNC for downlink transmissions.

Notably, unlike the present invention, <u>Schultz *et al.* is not related to the scheduling of uplink resources by a base station.</u> First of all, it should be noted that the GPS-based TFC selection algorithm of Schultz *et al.* is either used in the UE or the RNC (*see* page 21, lines 29-31), and not in the Node B (base station). Furthermore, the GPS-based TFC selection algorithm of Schultz *et al.* is not used to <u>schedule uplink resources in a Node B in response to scheduling requests by UEs</u>, but to <u>distribute already scheduled resources to the individual logical channels</u> within the UE or RNC.

Accordingly, Schultz *et al.* is not related to any feature of the presently claimed invention except for multiplexing flows to a transport channel.

9. I submit that the contents of 3GPP contribution Tdoc. R2-041519, "QoS and Scheduling Principles in HSUPA" by Nokia, in particular the "fourth option" described in section 2.1 thereof, and the contents of Kekki *et al.* and Schultz *et al.* are very different from each other and the presently claimed invention, as follows.

9.1. First, Tdoc. R2-041519, Kekki *et al.* and Schultz et al. Kekki et al. relate to completely different technical fields.

Tdoc. R2-041519 relates to the scheduling of uplink transmissions on a dedicated uplink channel in a mobile communication system taking into account the relative priorities of UEs, MAC-d flows or priority queues.

In contrast, Kekki *et al.* relates to the signaling of TNL-QoS information from a RNC to a Node B, so as to configure TNL, i.e. the interface between Node B and RNC, according to a TNL-QoS.

Further in contrast, Schultz *et al.* relates to an optimized TFC selection based on GPS that is distributing an already granted radio resource.

Taking the example of Fig. 23 above, this essentially means that Tdoc. R2-041519 and the Application relate to the scheduling procedure and related signaling between the MAC-d entities at UE and RNC, while Schultz *et al.* relates to the operation of a single MAC-d entity in either UE or RNC. Finally, Kekki *et al.* relates to the signaling of TNL QoS for the Iub interface between the Node B and the RNC.

9.2. Even if considering all three references, not one of the references relates to the following features of the presently claimed invention:

a) provide QoS attributes of multiple flows to be multiplexed onto a single dedicated uplink channel by a mobile terminal to a base station (Node B) from a radio network controller (RNC),

b) transmit a scheduling request from a mobile terminal (UE) to a base station (Node B) that includes a flow identifier identifying one of the plurality of flows to be multiplexed onto the single dedicated uplink channel by the mobile terminal (UE) and

c) schedule by the base station (Node B) uplink resources for transmissions of mobile terminals (UEs) on the dedicated uplink channel based on the QoS attributes related to the flow identified by the identifier.

10. In view of the above, these differences between the presently claimed invention and the three references discussed above would have made it necessary to carry out substantial adaptations that, in my opinion, would not have been within the level of skill of the ordinary worker at the time of the present invention, i.e., when the underlying European application no. 04023418.9 was filed. As further detailed below, I also believe that that a skilled worker at the time the Application was filed would have not have reasonably expected that carrying out the required

adaptations would have yielded a method allowing the scheduling of mobile terminals on a per-mobile terminal basis, while still providing a per-flow QoS differentiation.

11. If considering to supplement the subject matter of the 3GPP contribution Tdoc. R2-041519 with the subject matter of Kekki *et al.*, the ordinarily skilled worker would, in my opinion, have used the subject matter of Kekki *et al.* to configure the wired interface between the Node B and the RNC according to the TNL-QoS signaled, such that the uplink data transmitted on the E-DCH transport channel according to Tdoc. R2-041519 from the UE to the Node B would be further forwarded from the Node B via a transport bearer to the RNC according to the configured TNL-QoS signaled from the RNC.

Further considering the subject matter of Schultz *et al.*, in my opinion, the ordinarily skilled worker would use the optimized GPS-based TFC selection procedure of Schultz *et al.* to schedule the uplink transmissions of different logical channels multiplexed to the E-DCH transport channel according to a rate grant provided by the Node B according to Tdoc. R2-041519.

However, in my opinion, none of 3GPP contribution Tdoc. R2-041519, Kekki *et al.*, or Schultz *et al.* have any subject matter that would have led the ordinarily skilled worker to any modifications to a system combining the subject matter of 3GPP contribution Tdoc. R2-041519, Kekki *et al.*, and Schultz *et al.* so as to have the above-discussed features of the presently claimed invention. For example, such prior art lacks any disclosure of utilizing a per-mobile terminal scheduling approach and to include a flow identifier to the scheduling requests of the mobile terminals to allow for per-flow QoS differentiation in the scheduling decision, as defined in the claims.

12. I hereby declare that all statements made herein are, to my own knowledge, true and that all statements made on information or belief are believed to be true; and further that these statements are made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may

jeopardize the validity of the captioned patent application or any patent issued therefrom.

Date 12.12.2008

Joachim Löhr

Enclosures:
- Curriculum Vitae
- List of patents (applications)
- 3GPP TS 25.401, "UTRAN overall description (Release 6)", version 6.2.0, December 2003

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Education :

07/1997- 12/2002	Darmstadt University of Darmstadt, Germany Department : Electrical Engineering and Information Technology (majors: transmission technology, digital signal processing applied information and coding theory, satellite communication minors: radar technology, field theory, radio frequency technology, numerical mathematics, radio systems)
09/2002-12/2002	Diploma thesis at Panasonic R&D Center Germany (topic: study and application of erasure generation techniques for coding schemes in a multicarrier radio access communication system grade:1.3 *)
04/2001-10/2001:	Student research project (topic: DSP implementation of a digital receiver with adaptive channel equalization grade:1.0 *)
1988-1996	High school, Bad Homburg (final grade: 1,6 * graduated in upper 10% date of graduation: 26.06.1996 majors: Latin, Music minors: Physics, Mathematics)

Work experience :

04/2003 – present	Research engineer at Panasonic R&D Center Germany Wireless standard development. Representing Panasonic at 3GPP standard forum developing new features for 3G system and LTE system
01/2003 – 03/2003	research assistant at Panasonic R&D Center Germany (duties: development of a simulation tool for analyzing the convergence behaviour of turbo codes and LDPC codes by means of Exit charts)
06/2002 – 09/2002	research assistant at Panasonic R&D Center Germany (duties: extension of MC-CDMA Downlink Simulators in Matlab respectively C/C++ with new channel coding algorithms)
11/2001- 04/2002	Internship at Psytechnics (Ipswich, United Kingdom) (duties: development of algorithms and software for speech quality assessment)
04/1999 – 10/2000	research assistant at the Institute of Microelectronic Systems , TU Darmstadt (duties: programming in Java/VHDL)
Summer 1999	(5 weeks) Internship at Infineon Technologies, Munich, Germany (duties: programming in Java)

Skills : experience in programming C/C++, Java, VHDL
languages : Upper Advanced English
other interests: music(member of orchestra), University soccer, swimming

* grade scale:

1 - very good
2 - good
3 - satisfactory
4 – adequate
5 - failed

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Application Serial No.	Title	Publication No.	Patent No.
10/535664	Erasure Determination Procedure for FEC Decoding	US-2006-0184839-A1	
10/572277	Protocol Context Transfer in a Mobile Communication System	US-2007-0081492-A1	
10/567607	Serving Base Station Selection during Soft Handover	US-2007-0155388-A1	
10/568083	Base Station synchronization during Soft Handover		
10/567825	Time Monitoring of Packet Retransmissions during Soft Handover	US-2007-0079207-A1	
10/594496	Interference Limitation for Retransmissions	US-2008-0077837-A1	
10/594883	Interference Limitation for Uplink Retransmissions	US-2008-0276148-A1	
10/583090	HARQ Protocol with Synchronous Retransmissions		
10/586724	Method for Switching between Synchronous and Asynchronous HARQ Retransmission Timing	US-2008-0133995-A1	
10/586736	Method of HARQ Retransmission Timing Control		
11/547193	Delayed Base Station Relocation in Distributed Radio Access Networks	US-2008-0268852-A1	
11/587496	Relocation also of Parts of Radio Resource Management Control Functionality from one BTS to a Second in a Distributed Radio Access Networks	US-2008-0069088-A1	
10/583736	Scheduling Mode Dependent Data Transmissions	US-2007-0275728-A1	
11/149585	Cyclic transmission of notification coordinates in a communication system	US-2005-0288040-A1	
11/147399	Autonomous interruption of a notification sequence reception in a communication system	US-2005-282528-A1	
11/180920	Scheduling Mode Switching for Uplink Transmissions	US-2006-0018277-A1	

10/588073	Efficient Rise over Thermal (RoT) control during Soft Handover	US-2007-0281695-A1	
11/575937	Error Ratio Measurement in the Radio Link Control Layer for Quality of Service Control in a Wireless Communication System	US-2008-0076359-A1	
11/575935	Anonymous Uplink Measurement Report in a Wireless Communication System	US-2008-0056198-A1	
10/583671	Quality-of-Service (QoS)-aware Scheduling for Uplink transmisions on Dedicated Channels	US-2007-0121542-A1	
11/576173	Delay Estimation for Uplink Transmissions		
11/718492	HARQ Protocol Optimization for Packet Data Transmission		
11/302493	Support of Guaranteed Bit-Rate Traffic for Uplink Transmissions	US-2006-0182065-A1	US7362726B2
10/589859	Happy Bit setting in a Mobile Communication System		
11/909981	Scheduling of Mobile Terminals in a Mobile Communication System		
11/490485	HARQ Process restriction and transmission of Non-scheduled Control Data via Uplink Channels	US-2007-0047451-A1	
11/496743	MAC layer Reconfiguration in a Mobile Communication System	US-2007-0047452-A1	US-7321589-B2
12/067115	Packet Segmentation and Concatenation Signaling in a Communication System		
12/090973	Fast Radio Bearer Establishment in a Mobile Communication System		
10/094579	Configurable acknowledgement mode for Hybrid Automatic Repeat ReQuest Re-Transmission Protocol		
12/281759	Overhead Reduction of Uplink Control Signaling in a Mobile Communication System		
12/162592	Uplink Resource Allocation in a Mobile Communication System		
12/300607	Resource Reservation for Users in a Mobile Communication System		

12/162589	Resource Block Candidate Selection Technique Employing Packet Scheduling In Wireless Communication Systems		
11/588374	Time Monitoring of Packet Retransmissions during Soft Handover		
12/049819	Support of Guaranteed Bit-Rate Traffic for Uplink Transmissions	US-2008-0170504-A1	
12/240838	HARQ Process restriction and transmission of Non-scheduled Control Data via Uplink Channels		
11/857649	MAC layer Reconfiguration in a Mobile Communication System	US-2008-0008152-A1	